EGU2020-771
https://doi.org/10.5194/egusphere-egu2020-771
EGU General Assembly 2020

Meteotsunami research in the Strait of Georgia: Critical observational contributions from a student school network on Vancouver Island

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Meteorological tsunamis are frequently destructive tsunami-like waves generated by small-scale atmospheric disturbances. Several devastating events occurred recently in various regions of the world oceans, including the Balearic Islands, Sicily, the Adriatic and Black seas, the Great Lakes, the west coast of South Korea, the Netherlands and the Persian Gulf. Although this phenomenon has been actively studied for more than 25 years, the exact mechanism (or mechanisms) responsible for producing these extreme events remains a puzzle. One of the major problems making it difficult to determine the physical process generating meteotsunamis is the absence of a network of simultaneously working precise tide gauges and microbarographs in the affected region. A unique set of high-resolution atmospheric data from the meteorological “school network” of 132 school stations became available for 2008-2019 for the area of southern Vancouver Island and nearby Gulf Islands located in the Strait of Georgia. These data, combined with 1-min sea level data from Canadian Hydrographic Service (CHS) and USA National Oceanic and Atmospheric Administration (NOAA) tide gauges, has enabled us to examine both the spatial and temporal features of mesoscale atmospheric disturbances and coincident properties of the associated sea level oscillations. The data analyses, supported by a series of numerical experiments, has made it possible to reconstruct observed events and to determine the specific atmospheric parameters producing the strongest sea level response in the southern part of the Strait of Georgia. These experiments have helped us to recognize the most effective (and hence, most hazardous) directions and speeds of propagating atmospheric disturbances and to identify “hot spots” along the coast that are under the highest risk of large meteotsunamis.